



NOAA's Plans for the Continuity of Earth Radiation Budget and Climate Data Records

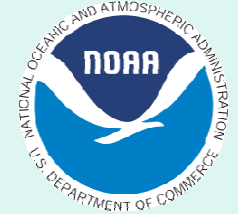
John J. Bates

NOAA's National Climatic Data Center (NCDC)

16 September 2010



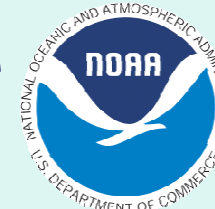
Outline



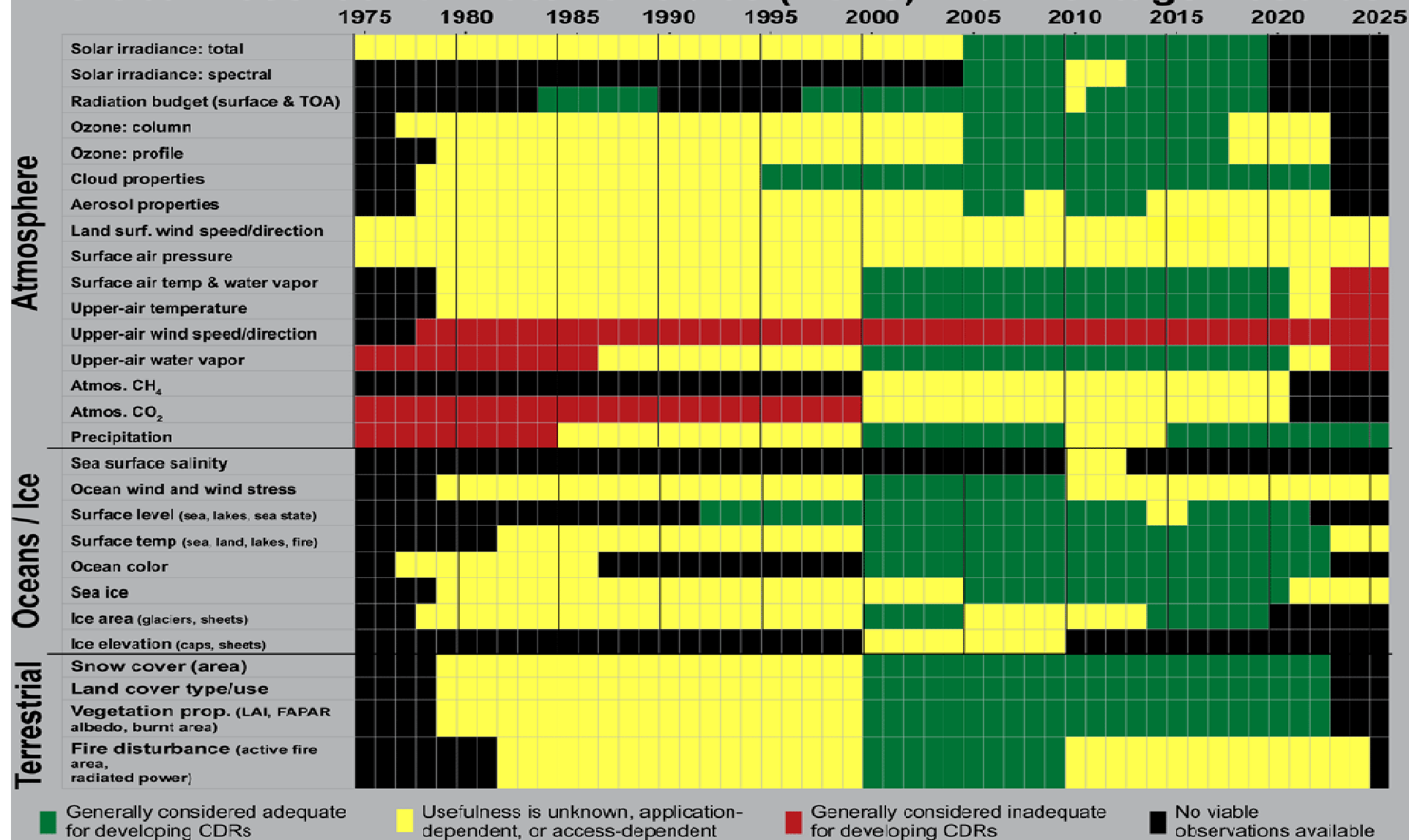
- Summary and status of NOAA's CDR Program
- Transition of mature cloud and radiation CDRs to sustained operations
- Plans for transition of Earth radiation budget to sustained operations at NOAA



ECV Status from a U.S. Perspective Need to Coordinate Internationally

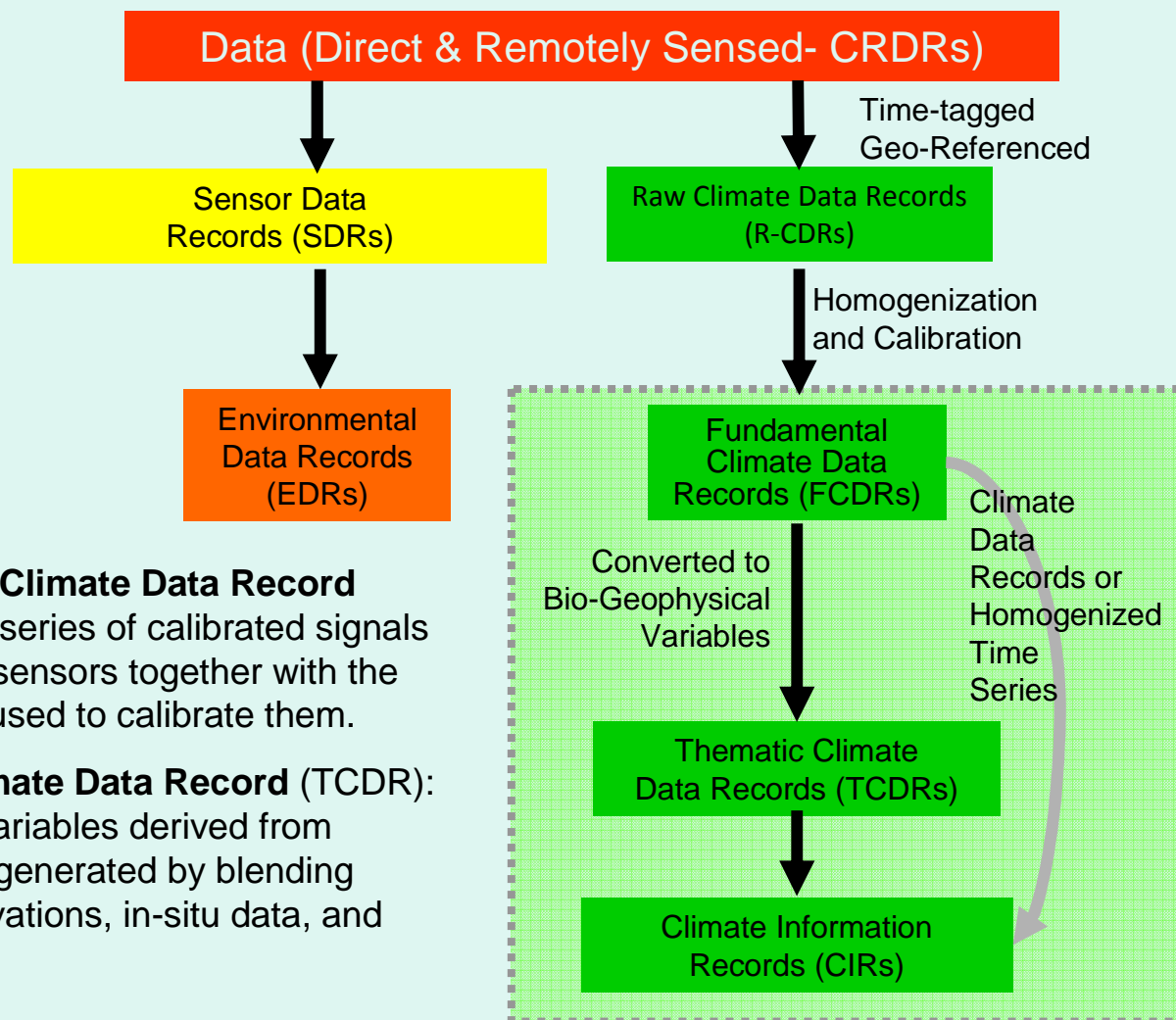
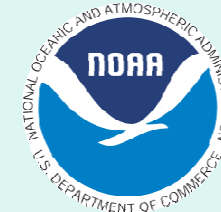


Global Essential Climate Variables (ECVs) with Heritage Records





CDR Information Flow

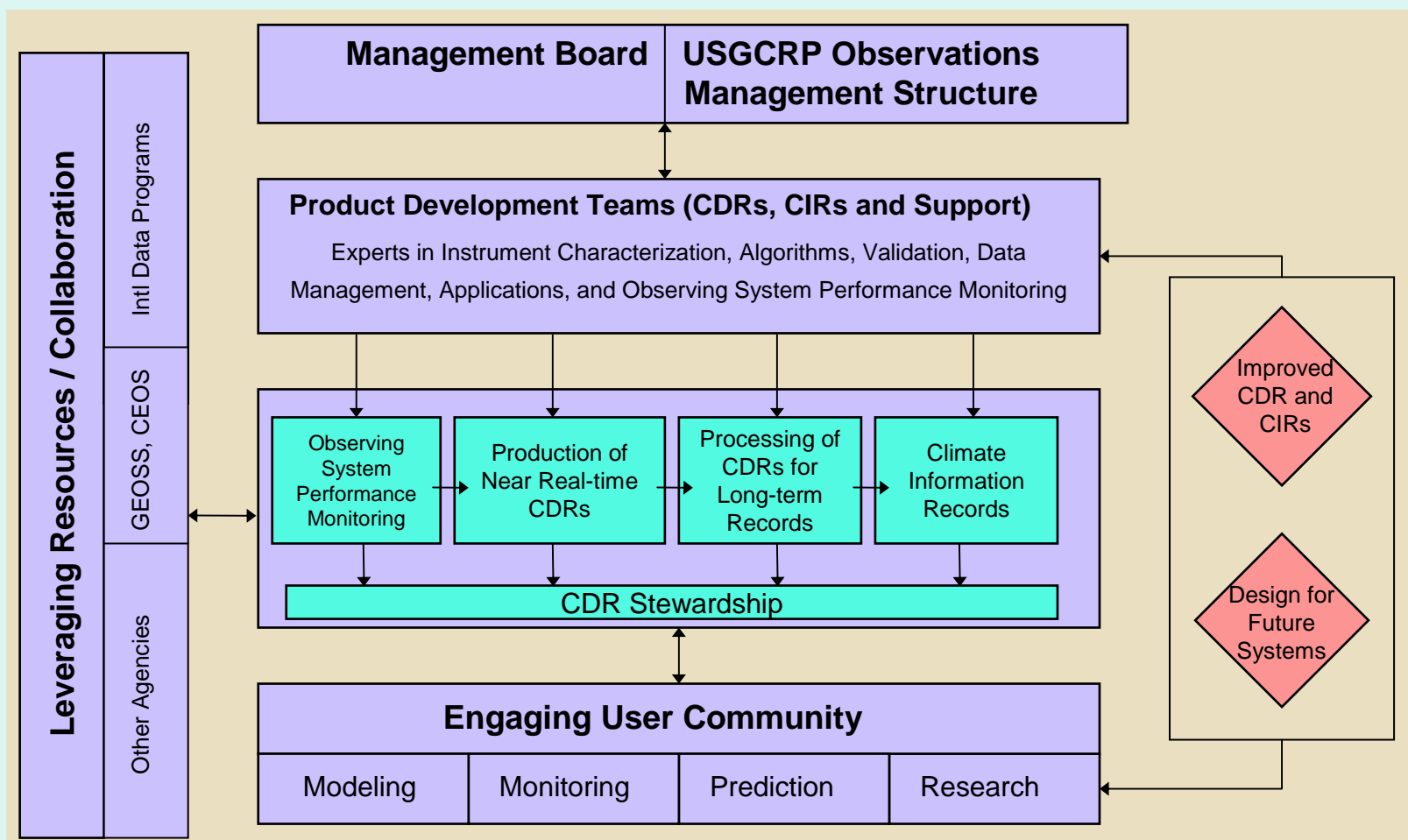
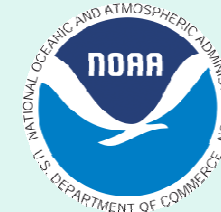


Fundamental Climate Data Record (FCDR): Time series of calibrated signals for a family of sensors together with the ancillary data used to calibrate them.

Thematic Climate Data Record (TCDR): Geophysical variables derived from FCDRs, often generated by blending satellite observations, in-situ data, and model output.

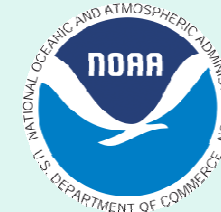


CDR Project Functional Framework





CDR Activities Address 3 Epochs



1970

1980

1990

2000

2010

2020

2030

POES/GOES/DMSP

NPP

JASON-3/JPSS/GOES-R...

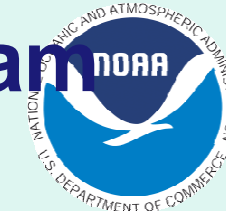
Uncover latent climate trend information
in four decades of heritage operational data

Extend CDRs using future
systems

Ensure climate quality data from NPP
and build Climate Raw Data Records (CRDRs) to facilitate reprocessing



Climate Sensor Coverage CDR Program Grants (future operational CDRs)

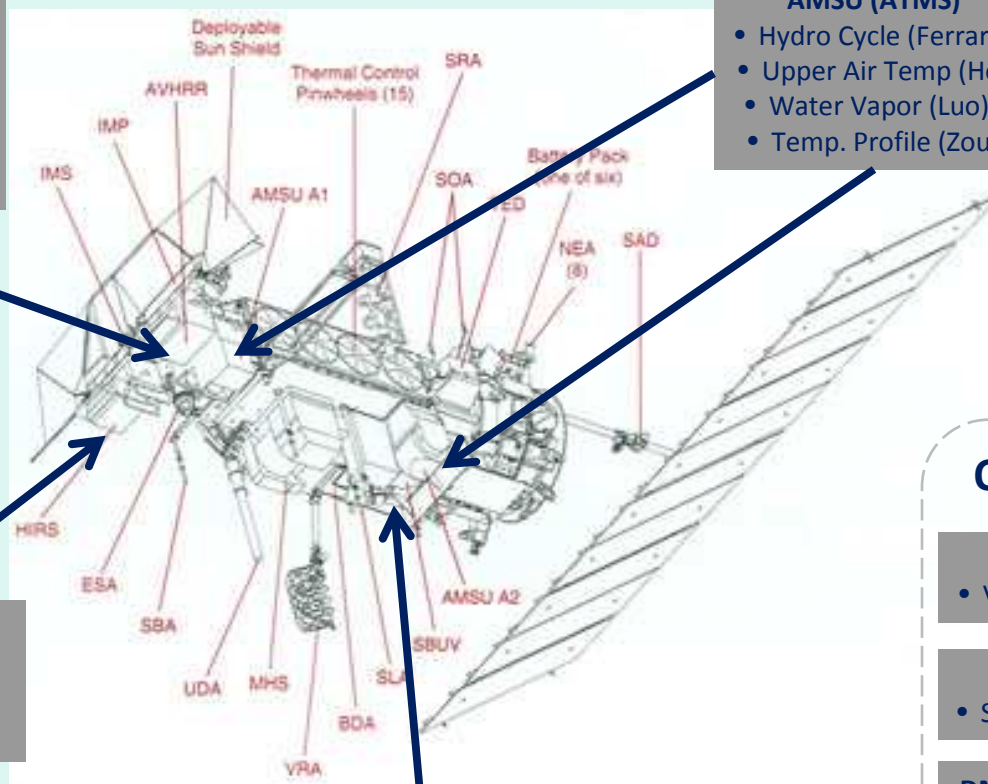


AVHRR (VIIRS)

- Cloud Properties (Kato)
- Snow/Ice (Key)
- VNIR Cal./Clouds Minnis)
- Thermal Calibration (Mittaz)
- Land/Carbon (Vermote)

AMSU (ATMS)

- Hydro Cycle (Ferraro)
- Upper Air Temp (Ho)
- Water Vapor (Luo)
- Temp. Profile (Zou)



HIRS (CrIS)

- [Calibration development at STAR]
- Water Vapor (Luo)
- Cloud Properties (Menzel)

- SBUV (OMPS)**
- Ozone (Flynn)

Other Satellites

GOES: Imager (ABI)

- VNIR Cal./Clouds (Minnis)

SORCE, Glory (TSIS)

- Solar Irrad. (Pilewskie)

DMSP: SSM/I, SSMIS (MIS)

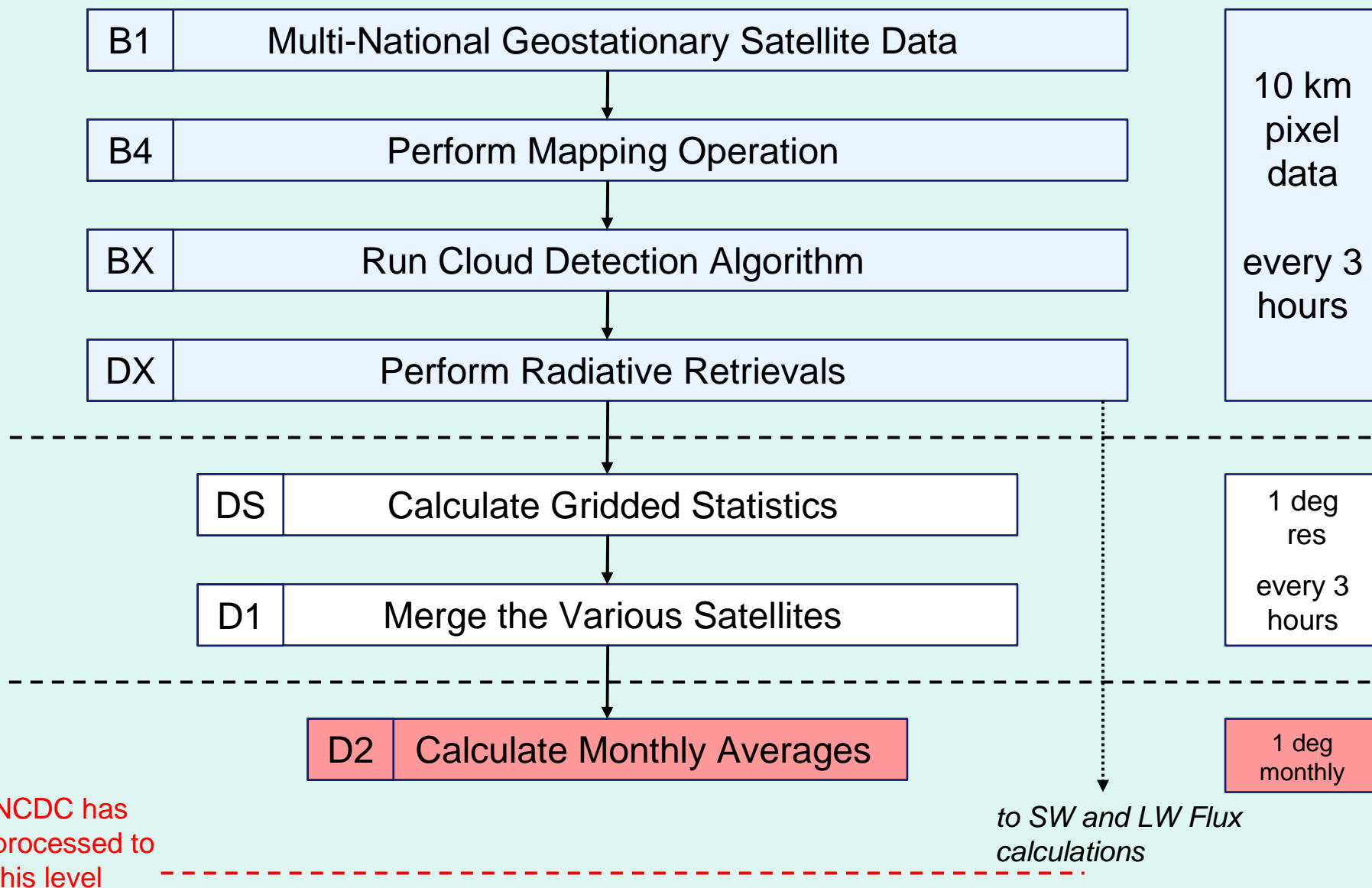
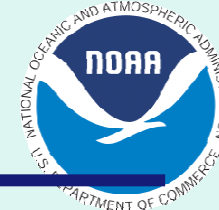
- Calibration (Kummerow)
- Snow/Ice (Key)
- Water Vapor (Luo)

WWW.NCDC.NOAA.GOV/SDS

Arrows identify key climate instruments

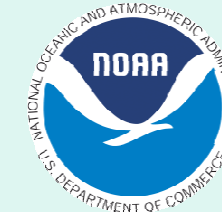


Preparing for CERES - ISCCP Reprocessing Data Flow

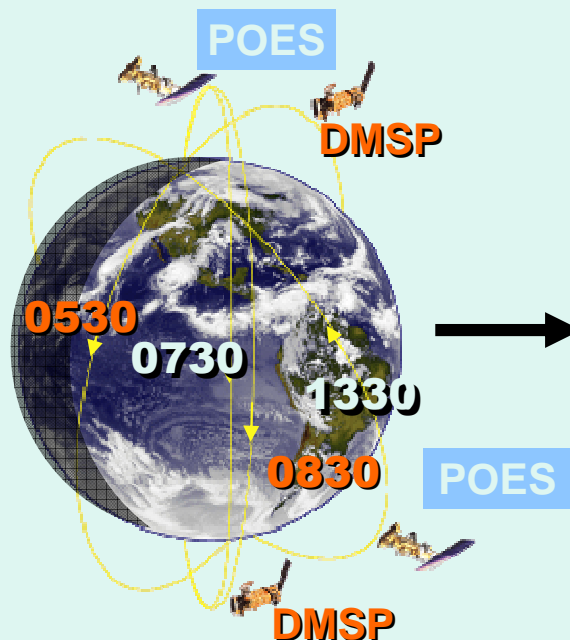




Polar Program Evolution



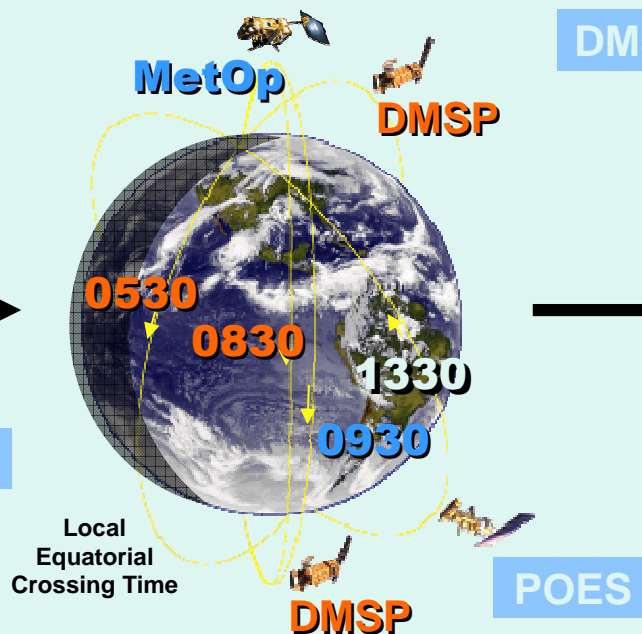
Historically



- 2 U.S. military DMSP
- 2 U.S. civilian POES

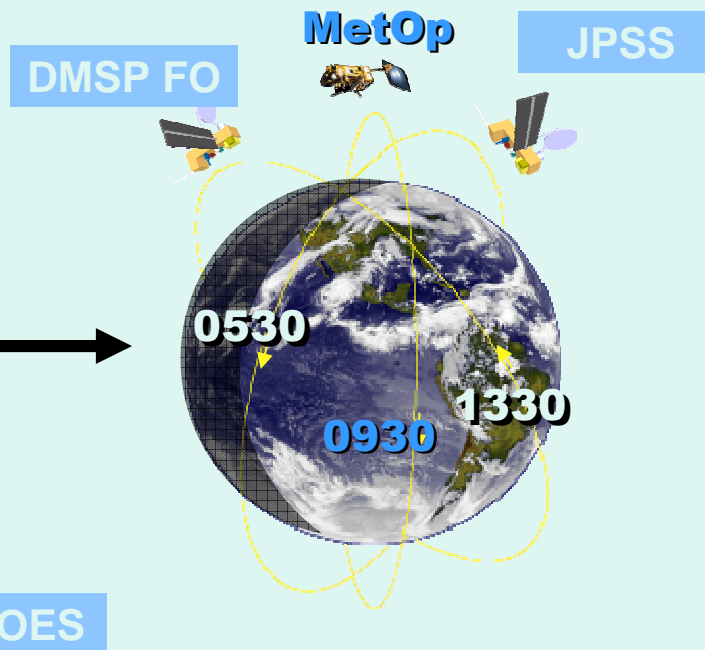
DMSP: Defense Meteorological Satellite Program
MetOp: Meteorological Operational Satellite

Today



- 2 U.S. military DMSP
- 1 U.S. civilian POES
- 1 European MetOp

Future

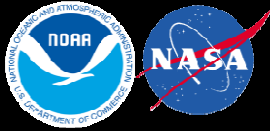


- 1 U.S. civilian JPSS
- 1 U.S. military DMSP follow-on
- 1 European MetOp

POES: Polar-orbiting Operational Environmental Satellite
JPSS: Joint Polar Satellite System (NOAA / NASA)

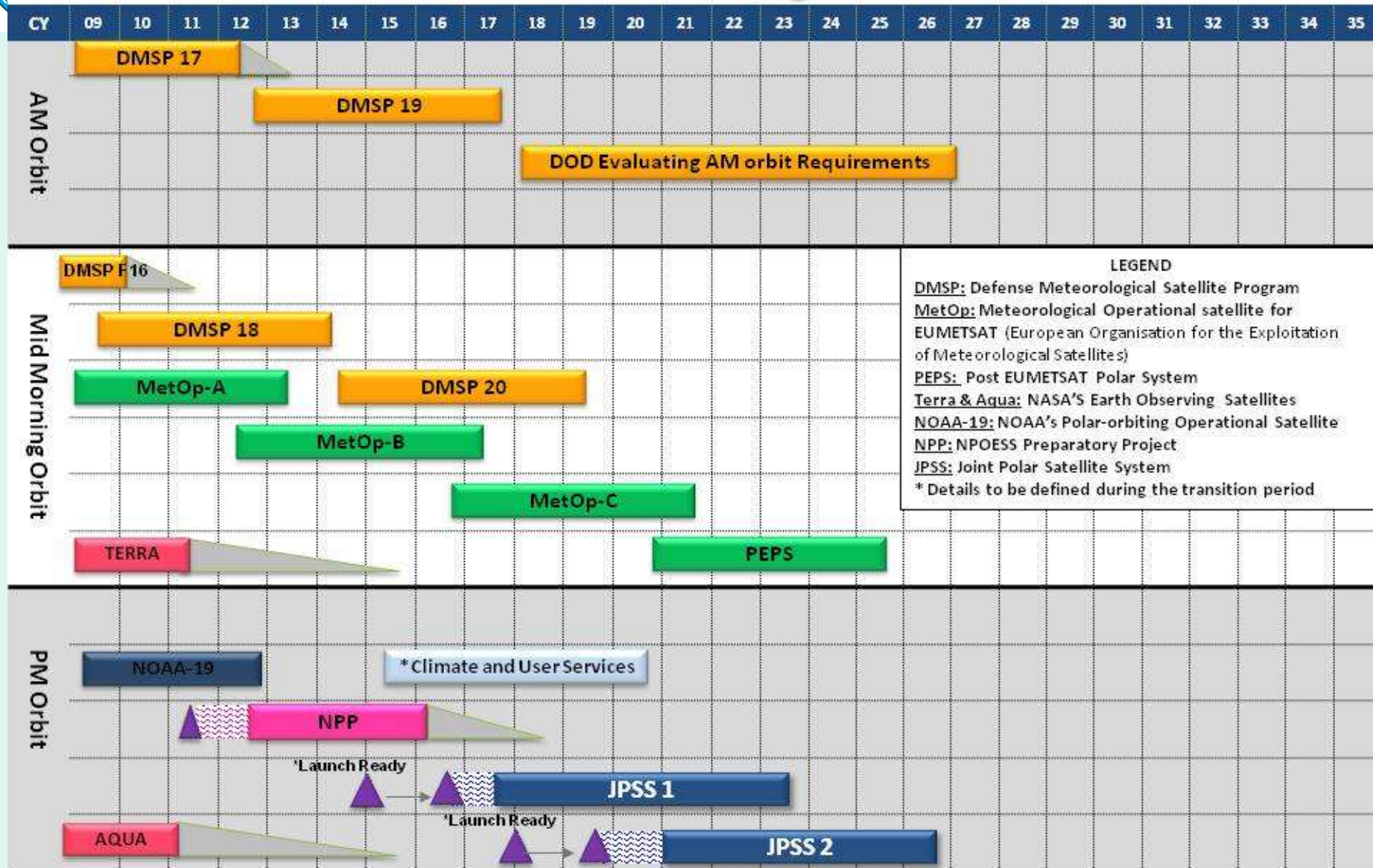
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NOAA Pre-Decisional Information



Continuity of Polar Operational Satellite Programs

Illustration



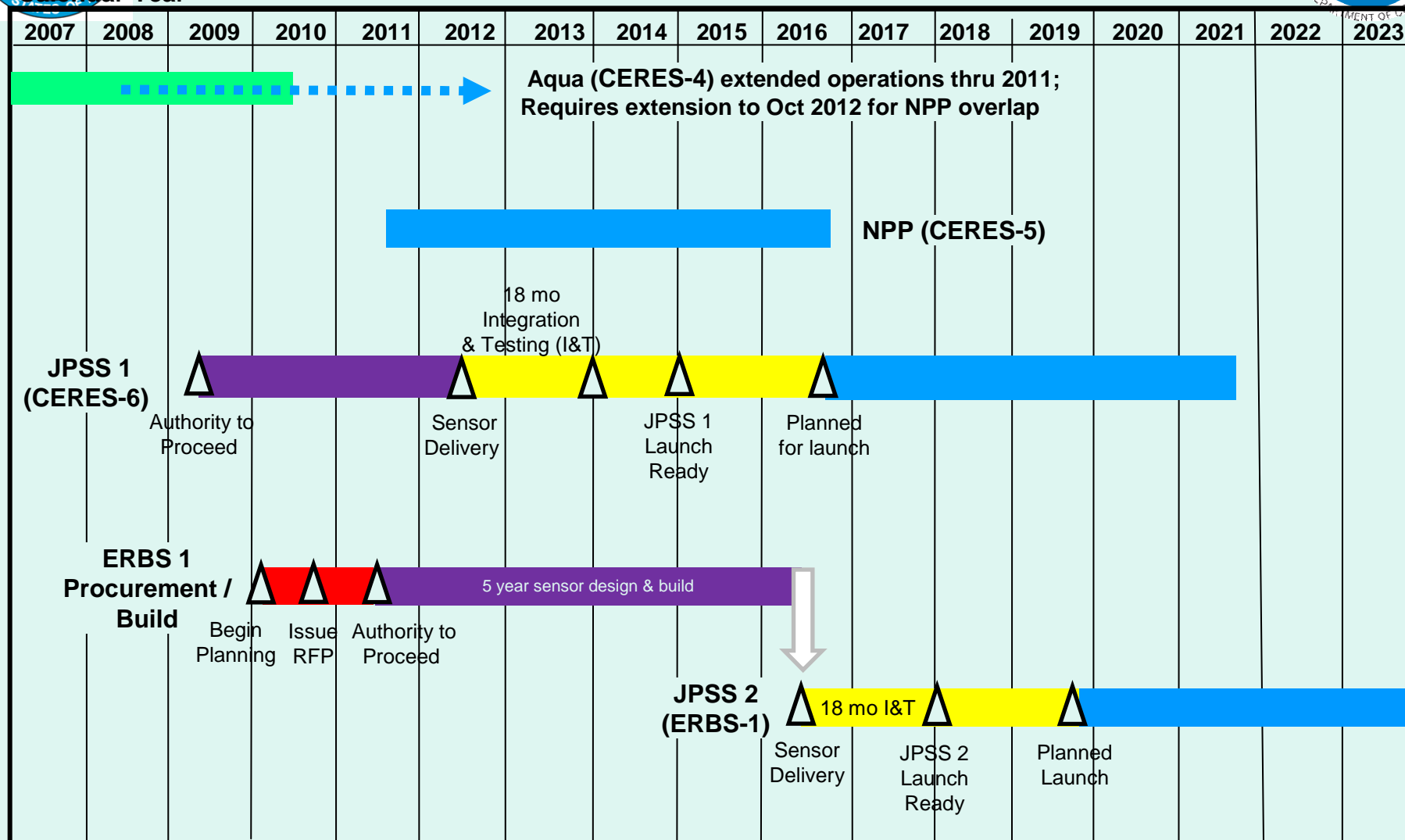


CERES/ERBS Planning Schedule



Calendar Year

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NOAA Pre-Decisional Information

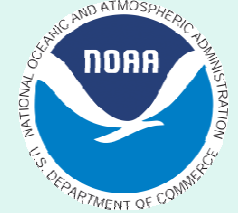


- NASA launch & sensor mission life
- Planning/SEB activities
- Sensor acquisition
- Satellite integration & test
- NOAA launch & sensor mission life

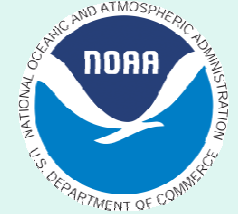
- Projected launch & sensor mission life
- Satellite is operational beyond design life
- Key events



Long-Term Planning for Continuity of ERB

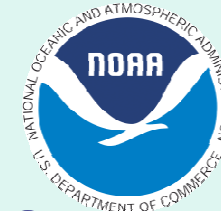


- NOAA has initiated long-term planning by initiating community requirements meetings
 - Continuity of Earth Radiation Budget (CERB) Workshop 13-14 July
 - Identify the purposes and current uses of Earth radiation budget observations.
 - Document the current status of research and applications of Earth radiation budget.
 - Identify observing system requirements for the continuity of the Earth radiation budget climate data records (CDRs).
- Workshop report being finalized – thanks to all for input
 - User Requirements
 - Instrument Requirements
 - Data Processing Requirements

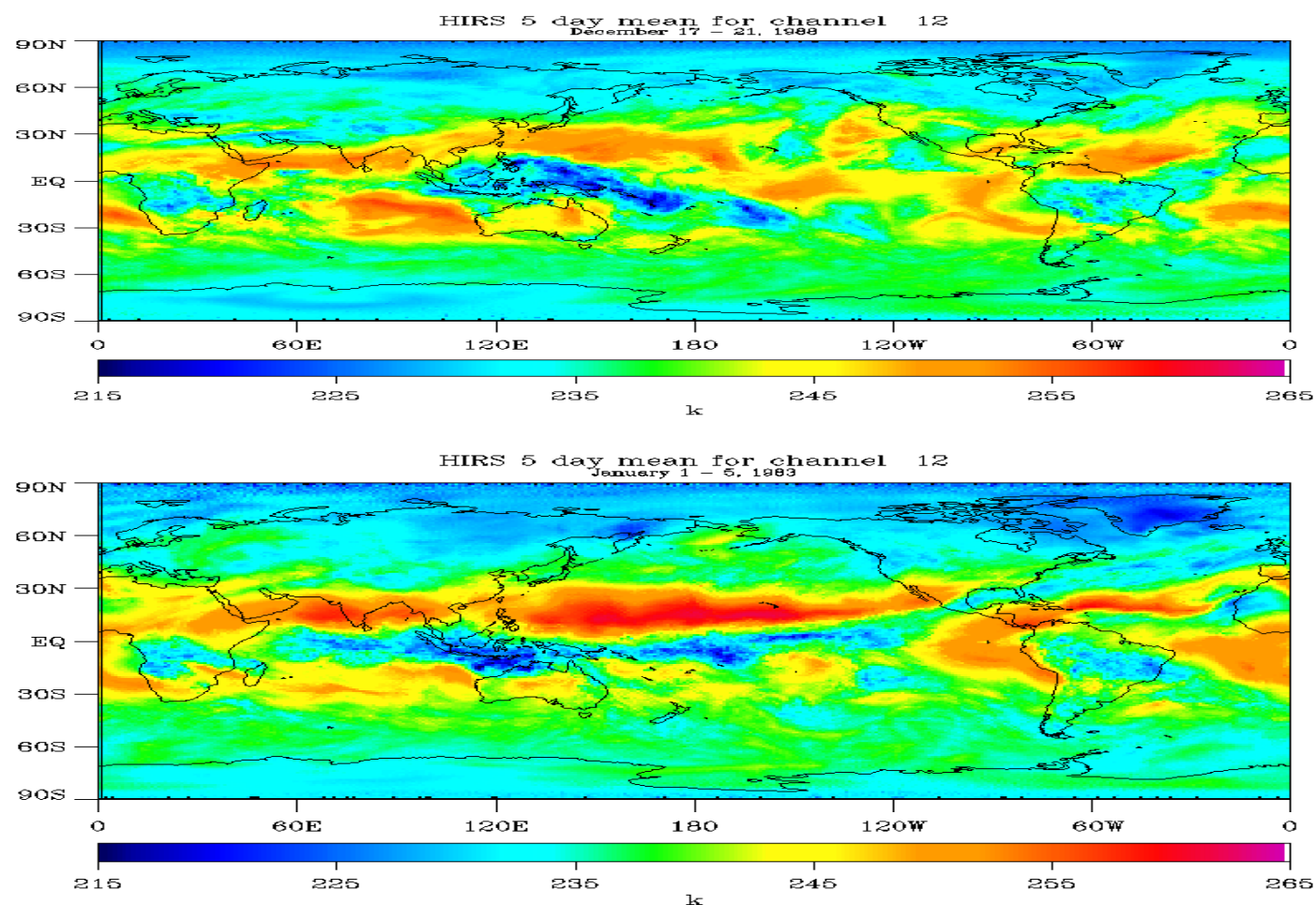


Conclusions

- NOAA has successfully recovered most climate sensors and added CDR processing capabilities
- NOAA's CDR Program has resources and is actively engaging the U.S. and international climate communities in sustaining climate observations, data production and services
- The current focus of NOAA's CDR Program is the water and energy budget including clouds and Earth radiation



Role of Transient Eddies in the Tropical Water and Energy Cycle





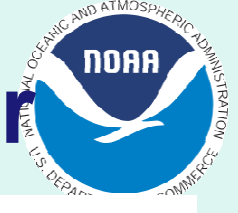
Transient Wave Activity in the Subtropical Eastern Pacific



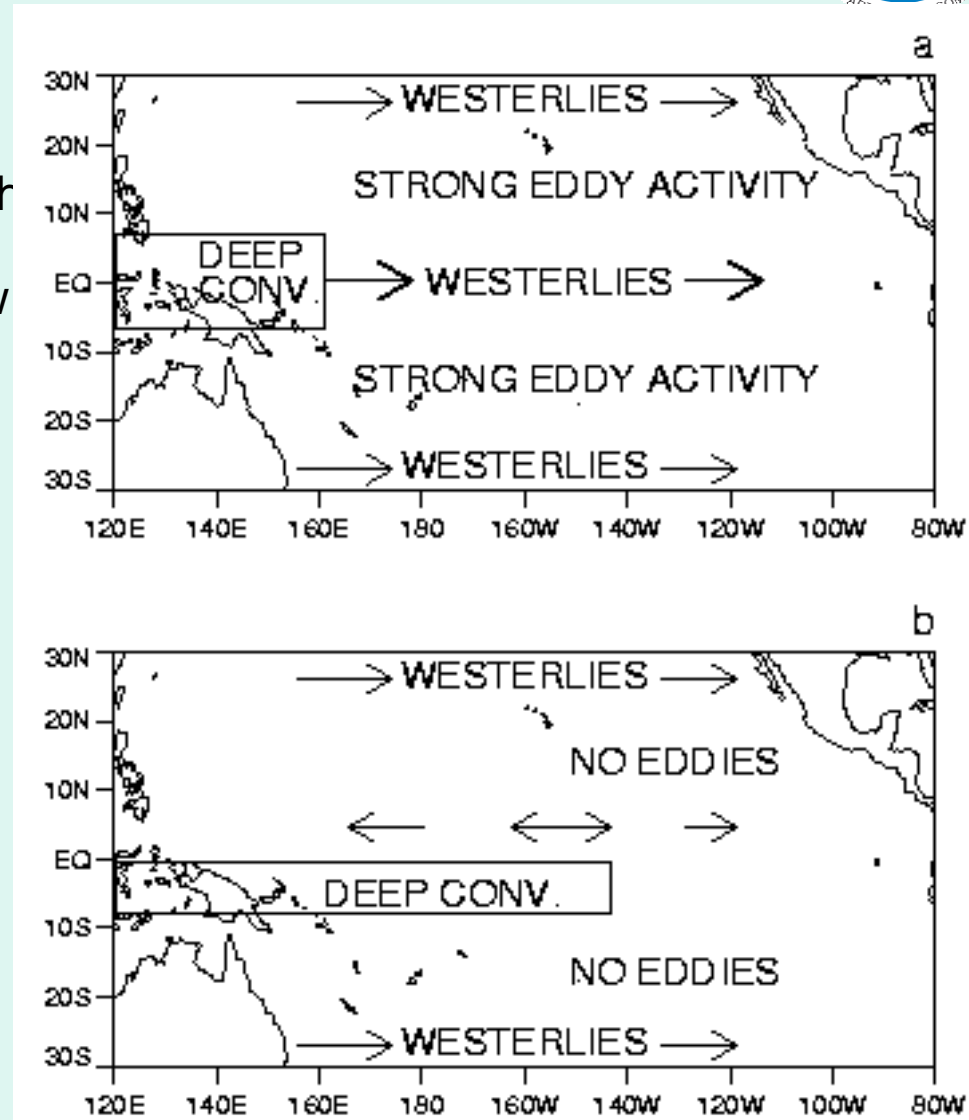
- Dynamically possible only in Northern Winter and Spring
- Large interannual variability associated with ENSO basic state (time-mean) flow
- Related to 'westerly duct' size determined by stationary Rossby wave number
- 2/3rds of extremes in UTWV time series occur in these months



Stationary Rossby Wave Number

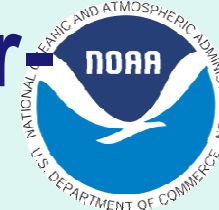


- $K_s = (\beta^* / \bar{U})$, where $\beta^* = \beta - \frac{1}{2} \bar{U}^2 / y^2$
- K_s is the total wavenumber at which a barotropic Rossby is stationary with respect to the background flow
- Rossby wave numbers below 10 indicate regions of strong eddy activity, above 15 indicate regions of weak eddy activity
- Plot Rossby wave numbers for months of normal, moist extremes, and dry extremes of UTWV

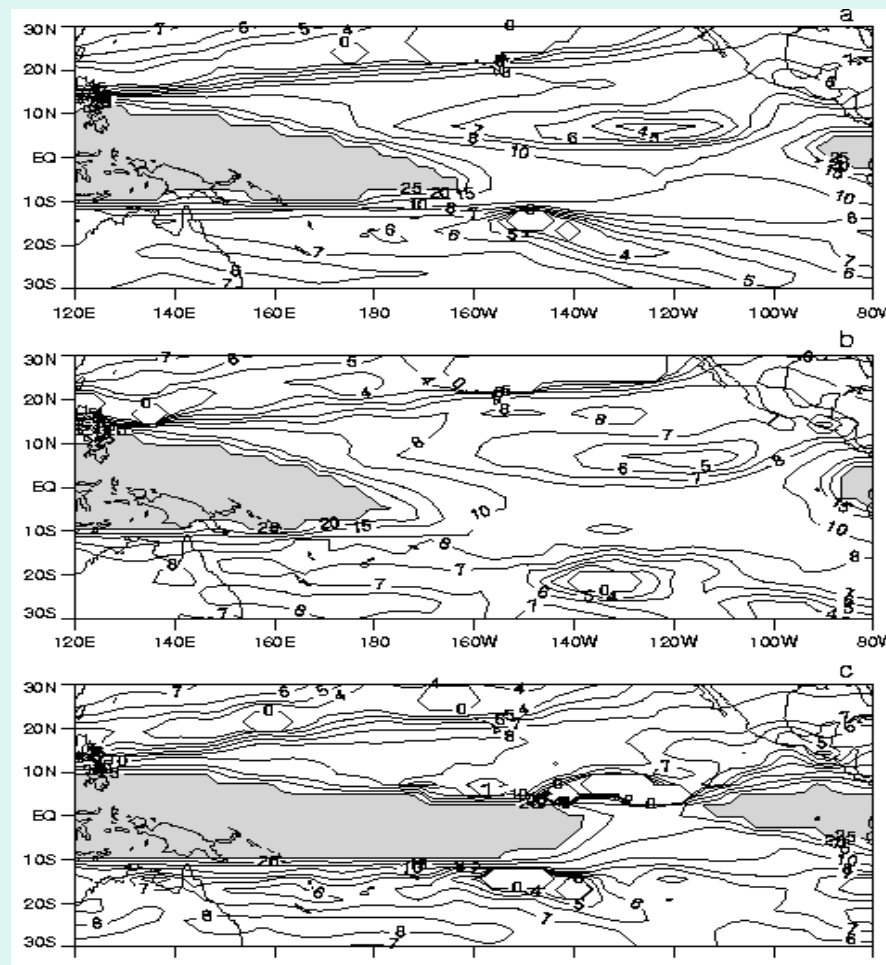




Stationary Rossby Wave Number Diagrams for Mar-Apr-May



- For UTWV normal, wave duct is open
- For moist UTWV extremes, wave duct is further open
- For dry UTWV extremes, wave duct is closed





Future Work



- To what extent is the tropical hydrological cycle determined by weather-climate connections?
- How do tropical subseasonal transients interact with seasonal, interannual and decadal variability?
- How does 'feedback factor' approach account for the important role of eddies vs mean quantities?

